
ebb & flow

Reviving a River

By Bruce Carlisle and Tim Smith, CZM Wetlands Restoration Program

The Chequesset Neck Dike: Restricting tidal flow since 1908—d'oh!

For thousands of years, the Herring River in Wellfleet, Massachusetts, was a highly productive estuary. In its unaltered state, the river offered vast feeding and nursery habitat for many commercially important fish and shellfish, cycled nutrients and sediment to provide clear water, produced salt hay for animal fodder, and buffered storm surges. The river was so productive, in fact, that in the 1890s, the catch of alewives and blue back herring averaged more than $640 per year (or about $13,000 in today's dollars), enough to pay all of the Town's elected officials, according to yearly town reports.

Since that time, however, human activities have had far-reaching effects on the river's natural function and social value. Throughout the 1800s and early 1900s, as the Cape became more developed, road and railroad dikes were built across the river's floodplain, bisecting the salt marshes and dramatically altering natural tidal patterns. Additionally, to create drier areas for agriculture and building, natural river and creek channels were straightened, ditches were dug, and dredged spoils were used to fill wetlands and floodplain areas.

The effects of this human disturbance were both dramatic and subtle. With the creation of the Chequesset Neck dike in 1908 (see photo left), species such as alewives, eels, striped bass, and silversides could no longer enter into the Herring River system, and the valuable herring run was severely impaired. By 1919, the value of the herring fishery was reduced to a mere $86 per year (or about $1,700 in today's dollar value). Over time, the thousands of acres of highly productive salt marsh gradually degraded and, by the middle of the 20th Century, the once thriving system had turned into brackish, freshwater, or upland vegetation, much of it dominated by the invasive common reed, *Phragmites australis*. The peat, which forms the foundation of a healthy salt marsh, is slowly decaying and so far has subsided nearly three feet lower than its historic elevation. Draining of the salt marsh peat has led to serious water quality problems. Lacking seawater and exposed to oxygen, naturally occurring sulfur in the peat is converted to sulfuric acid, at times causing the water in the Herring River to be as acidic as lemon juice, a condition that has led to many fish kills over the past several years. In addition, the acid causes toxic metals, primarily aluminum, to mobilize from the soil to the water column—a state that is serious enough to warrant

topography map courtesy of University of New Hampshire; photos courtesy of Cape Cod National Seashore

the Herring River's placement on Massachusetts's List of Impaired Waters not meeting surface water quality standards.

In a coordinated effort to turn the tide for this estuary, the Massachusetts Office of Coastal Zone Management's (CZM) Wetlands Restoration Program (WRP) is working with the National Park Service (NPS) and the town of Wellfleet to restore tides to the Herring River system. As agreed to in a Memorandum of Understanding (MOU) between the town and NPS, CZM is a participant in a technical working group formed to advise Wellfleet on the merits of restoring tidal flow to the river and identifying the preferred means for doing so. The MOU also prescribed the creation of a committee to ensure that concerns of local landowners, fishermen, aquaculturists, and others are taken into consideration. Pending approval of the committee's recommendations by the Board of Selectmen, the technical committee will develop a comprehensive restoration plan for the river. Encompassing more than 1,000 acres of inter- and sub-tidal estuarine habitat, the project—if undertaken by Wellfleet—will be the largest and most ambitious wetland restoration project attempted in Massachusetts, if not the entire Northeast.

What It Could Be

The Herring River originates as a small stream at Herring Pond in north Wellfleet. As it flows southwestward, it gathers volume from groundwater. Where the river meets Wellfleet Harbor at Chequesset Neck, it is nearly 500 feet wide—one of the largest river mouths on Cape Cod. About 80 percent of the Herring River's floodplain is located within the Cape Cod National Seashore. Since the 1970s, NPS scientists and others have been studying the tide-restricted estuary to understand its current condition and the effects of restoring the tidal connection to Wellfleet Harbor. Research and modeling conducted or commissioned by the NPS show that a wider opening of the Chequesset dike would reintroduce enough seawater to re-saturate the peat, reduce production of sulfuric acid, and improve water quality. Restoring tidal influence to the Herring River would deliver marine sediments and the marsh surface will gradually rebound to self-sustaining elevations. Clams and oysters would return as salinity rises, and alewives and blue-back herring would once again migrate freely from Herring Pond to Cape Cod Bay.

A portion of the Chequesset Yacht and Country Club golf course lies within the historic floodplain of the Herring River.

In the 1960s, before anyone contemplated deliberately restoring tidal flow to the river, the one-way flapper valves in the Chequesset dike rusted and became stuck in a partly

open position. For several years a limited amount of seawater returned to the diked system. The response was immediate and encouraging. With more saltwater, soft-shell clams and oysters eventually returned to the inter-tidal flats, some non-native *Phragmites* died off, and native salt marsh grasses came back. Though modest in scale and restricted to the area just above the dike, these incidental improvements were not unnoticed and soon salt marsh ecologists, local advocates, and NPS managers were advocating for additional tidal flow and a more cohesive and coordinated approach to restore the river.

Golf Balls and Mummichogs

As with any project of local and regional significance, returning tidal flow to the Herring River is not without its complexities. One of the largest challenges is the fate of several golf fairways belonging to Chequesset Yacht and Country Club (CYCC). Constructed in 1934 when the dike had significantly reduced the river's former tidal footprint, portions of five holes within the nine-hole course were built on what used to be salt marshes. Gradual subsidence of these areas has resulted in serious drainage problems, enough so that after heavy rains or with springtime high water tables, prolonged flooding makes it impossible to play golf. Returning the river's tidal flow would similarly inundate these low-lying areas during high tides.

The Chequesset Neck dike prevents freshwater from flowing into Wellfleet Harbor.

photo by Tim Smith

The WRP played an important role in addressing this challenge. Numerous federal, state, and private sector partners were brought together with the CYCC to discuss potential solutions. One of the early proposals to address the course flooding was to build a new, smaller dike at Mill Creek to protect the golf course. This concept was less than ideal, though, as impounded waters would have to be pumped over the dike, flooding would still occur after very heavy rains, costs would be high, and the dike would be detrimental to wetlands further up along Mill Creek.

After more meetings and discussions among the project partners, ideas for relocating part of the CYCC course began to take shape. The show of technical and financial support from the project partners was a critical factor in CYCC's decision to consider making drastic changes to their lands and golf course operations. With support from CZM, the Conservation Law Foundation, National Oceanographic and Atmospheric Administration (NOAA), the Gillette Company, and Massachusetts Corporate Wetlands Restoration Partnership, the CYCC is working with environmental and golf course design consultants to develop plans to reconfigure the golf course adjacent to undeveloped upland they own.

Through the partnership, a funding strategy was developed—CYCC will sell off about 25 acres of its low-laying lands to the town of Wellfleet. The money will go towards the construction and related costs of the course reconfiguration. As for the land, Wellfleet will create a publicly accessible conservation area. After restoration of tidal hydrology to the Herring River system, the abandoned fairways and greens will eventually return to salt marsh, providing critical habitat for mummichogs and alewives, soft-shell clams and fiddler crabs, and Snowy Egrets and Willets.

Open Space funds for a portion of this acquisition have already been approved at Wellfleet's Town Meeting. Additional matching funds are being sought from several other state and federal land acquisition programs. Through the tireless lobbying efforts of the Nature Conservancy, on November 10, 2005, Congressman William Delahunt (D-Massachusetts, 10th), along with Senators John Kerry (D-Massachusetts) and Edward Kennedy (D-Massachusetts) announced a $500,000 federal appropriation for the project through the Coastal and Estuarine Land Conservation Program. In his press release, Congressmen Delahunt said, "This is a political victory with potentially spectacular natural consequences. So often these days, we're forced to defend against assaults on the environment. It is gratifying to bring home some affirmatively good news about joint stewardship of public lands."

Work In Progress

Despite the clear ecological benefits of restoring tides to the Herring River, a range of public concerns still exist. These include the potential for sediments and bacteria to migrate to oyster growing areas and shellfish habitat in Wellfleet Harbor, possible erosion of the "Gut" (right), saltwater intrusion of private water supply, flood impacts to several private residences within the Cape Cod National Seashore, and effects of saltwater on freshwater wetland and upland vegetation. The NPS and CZM have conducted numerous studies to address these issues in recent years, which are currently under review by the technical and public committees formed through the MOU and will form the basis for Wellfleet's decision to move ahead with the restoration.

While the vision of a healthy, free-flowing Herring River is coming into clearer focus, a great deal of work remains. Before the vision becomes reality, Wellfleet's Board of Selectmen must support the plan, a clear path to restoring tides must be developed, and substantial funds need to be raised. If the momentum, energy, and early successes of the restoration partnership can truly persevere, in a matter of several years, the Herring River will be on its way to its former glory and the people of Wellfleet, the Cape, the Commonwealth, and the Northeast will have reclaimed a true national treasure.

pictometry image courtesy of MassGIS

The Herring River floodplain is now dominated by Phragmites, *black cherry, and other plants not typically found in salt marsh environments.*

Studies sponsored by the Cape Cod National Seashore have demonstrated that the Gut will not be threatened by restoring tidal flow to the Herring River.

Daylight shining through the left bay shows the limited opening of one Chequesset dike tidegate.

Creative Thinking and *Active* Learning:
The Buzzards Bay Stormwater Mapping Collaborative

By Dr. Joe Costa, Buzzards Bay NEP

In 2003, the Buzzards Bay National Estuary Program (NEP) published the report, *Atlas of Stormwater Discharges in the Buzzards Bay Watershed*. Several years in the making, the 100 plus-page report includes maps of more than 2,600 stormwater discharges and more than 12,000 catch basins along the shores of most of Buzzards Bay. The Atlas also includes a preliminary priority ranking of potential remediation projects based on numerous factors, including the number of known catch basins connected to the discharges, the presence of shellfish beds near the discharge, and if the shellfish beds had been closed due to pollution.

Using hand held Global Positioning System (GPS) devices, students were able to map stormwater discharge areas within Buzzards Bay.

photos by Joe Costa

To produce the Atlas, the Buzzards Bay NEP first mapped discharges within a half-mile of shore using grant funding to complete the project. Municipal officials receiving the reports and poster-size maps of their town appreciated the Atlas, but wanted more maps of their entire town. Fire chiefs wanted the maps to help respond to toxic spills on roadways, boards of health were trying to identify inland sources of pollution, and public works departments needed this information for their new "Phase II" stormwater management permits, now required by the U.S. Environmental Protection Agency (EPA). Inland towns wanted their communities mapped for the same reasons. Unfortunately, the Buzzards Bay NEP did not have the personnel or resources to meet these needs, and hiring private contractors to do the work was too expensive for most towns.

Len Gonsalves, Executive Director of the Buzzards Bay Action Committee (BBAC), proposed a solution. Recognizing that the Buzzards Bay NEP had successfully used student interns to do routine mapping of stormwater drainage networks in the field, he believed that the BBAC could fund students as part of a vocational high school work-study program to do the time consuming, and typically most expensive part, of any field mapping program. Len knew some teachers at Greater New Bedford Regional Vocational Technical High School (GNB Voc-Tech), and knew Voc-Tech wanted to expand its environmental education program, and thought a partnership with BBAC could benefit both organizations.

So, in 2003, the Buzzards Bay NEP began a partnership with the BBAC and GNB Voc-Tech to set up a pilot program to map stormwater networks in Buzzards Bay municipalities. The Buzzards Bay NEP provided technical support and training to guide the effort, and to evaluate the Geographic Information System (GIS) data. The BBAC bought GIS software for the school and paid the students' work-study salaries. The students mapped inland portions of

Dartmouth, Westport, and Fairhaven—all areas that had not previously been mapped by the Buzzards Bay NEP.

In 2004, the BBAC expanded the stormwater mapping partnership further and hired a consultant, Maurice "Moe" Leger, to work with the students. Moe had been working as an assistant harbormaster in Dartmouth and had just finished mapping moorings in that community. After working with students, Moe developed a clever innovation for the stormwater mapping.

In previous years, students had brought out very detailed aerial photographs where features such as driveways, houses, and even cars could be discerned. Student marked up the photos with locations of catch basins and discharges. Later these maps were brought back to the classroom, and using the GIS software and a "heads up" mapping approach, computer map data files were created. This mapping technique had the accuracy needed for stormwater planning maps, and proved faster than using a Global Positioning System (GPS) in the field and processing the data later. However, Moe saw the benefits of having a GPS out in the field if he could eliminate some intermediate steps of converting the data.

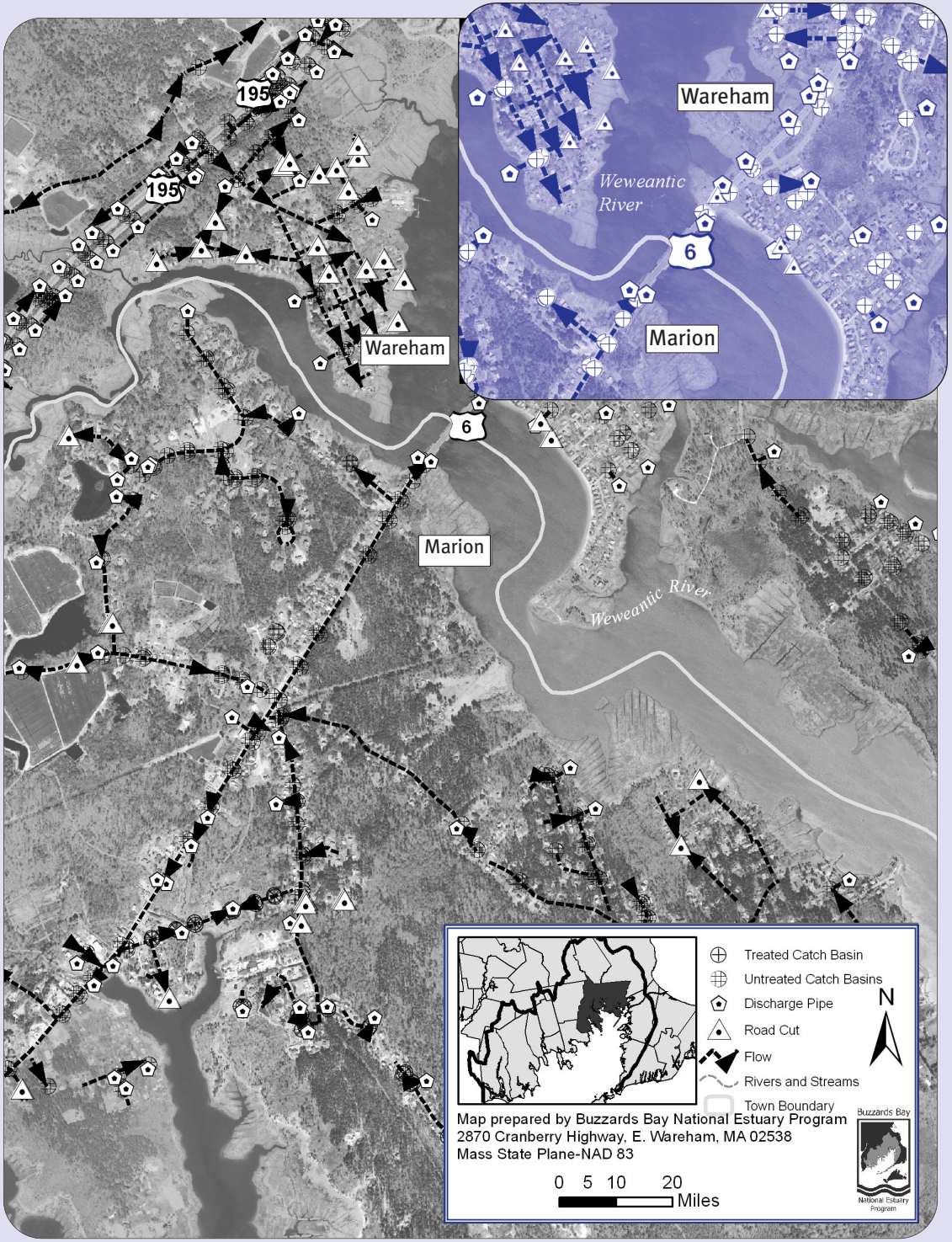
Moe's innovation was to combine in the field heads-up GIS software digitizing with real-time GPS data point collection, using teams of two students driving through neighborhoods. The students had their GPS units linked to their laptops (through wireless or cables), and edited their stormwater GIS database in real time, simply by following their positions on detailed aerial photographs. This strategy proved to be the fastest and most reliable data collection technique for the students, enabled them to correct any inaccurate GPS positioning, and allowed them to enter information as they drove from site to site. The students could also map "on-the-fly" other features that the towns wanted, such as fire hydrants.

[Handheld combined GPS-GIS units with these capabilities had just come to market, but they were not yet affordable for this program.]

By the end of 2004, the BBAC had spent more than $12,000 of their funds and were running out of money. The BBAC wanted to continue the effort and map all inland areas of the Buzzards Bay watershed, but could not afford to do it alone. To meet this need, the Buzzards Bay NEP partnered with the BBAC and GNB Voc-Tech to develop a grant application to fund the remaining work. In March of 2005, Massachusetts Office of Coastal Zone Management (CZM) awarded nearly $19,000 to fund the remaining work, with an additional $16,000 match of cash and in-kind contributions from the BBAC and Voc-Tech.

Sarah Raposa from the Buzzards Bay Program and Nathan Aruda, a student at Greater New Bedford Regional Vocational Technical High School, combine GPS and Geographic Information System (GIS) technology to accurately plot points for the Buzzards Bay Atlas.

Through 2005 this study mapped thousands more stormwater discharges, road cuts, and catch basins in seven Buzzards Bay municipalities. Continuing through the end of 2005, the program partners, including newly hired NEP Natural Resource Planner, Sarah Raposa, worked with municipal public works departments to make final revisions to the maps and data. In November, the NEP provided $15,000 for municipalities to purchase laptop tablets and GPS units so that they could use and update the stormwater drainage system database, and participate in the collaborative. For his Senior Project, Voc-Tech student Nathan Aruda prepared a manual and made presentations to municipal public works staff on how to use and manage the database



on these systems. Most importantly, through this partnership, the Buzzards Bay NEP and BBAC helped GNB Voc-Tech create a successful and self-sustaining environmental education program that not only serves the needs of nearby municipalities, but also provides the students with invaluable skills.

This stormwater mapping collaborative has had other benefits to Voc-Tech and their students. In 2004, GNB Voc-Tech, using their pilot work with the Buzzards Bay NEP and the BBAC, was able to obtain a $45,000 grant from the Massachusetts Department of Education to assist in establishing the school's new Geodesy/Environmental Engineering program. The new Geodesy/Environmental Engineering teacher oversaw students in the stormwater program during 2005, as well as students working on other GIS projects. Students who have participated in the collaborative have benefited as well. One of the first students to participate in the program was hired before going to college, as a contractor by the City of New Bedford to help revise and update the City's stormwater maps. Two more Voc-Tech students were hired by New Bedford to do follow-up GIS work the following winter. According to Steven A. Walker, an administrator at GNB Voc-Tech who helped establish the program, "We are preparing students for higher education in the field of environmental engineering so that they can obtain high-end jobs in that field. We see a strong demand for expertise in this field, and the students are excited by this new environmental program."

For more information about this stormwater mapping collaborative, visit www.buzzardsbay.org/stormatlas-collaborative.htm.

Where it all goes: The information collected is used to map out catch basins, streams, drainage pipes and the like, such as on this map of the Wareham/Marion area.

Just Add Water! *By Arden Miller, CZM*

Captain Jacques Cousteau, the famed French "musketeer of the sea" and co-inventor of the self-contained underwater breathing apparatus (scuba), once said, "The oceans are superior to land as an environment for life support. They provide directly the water fundamental to all forms of growth, laden with vital salts, dissolved gases, and minerals…" Whether or not you believe this to be true, it is undeniable that the oceans—all four of them (you know, the Atlantic, Pacific, Antarctic, and Indian)—cover 71 percent of the Earth's surface, support an estimated 275,000 plant and animal species, and constitute 97 percent of all the water in the world. Add to that the fact that more than half the world's population—that's close to 3 billion people—live within 60 miles of the coastline, and the entire population combined consumes around 29 million tons of fish annually,[1] and there's no denying it: from Bali, Indonesia to Boston, Massachusetts, the oceans affect us all in some way or other.

> *"The oceans are superior to land as an environment for life support."* - Jacques Cousteau

And, while all that is a lot to visualize—does anyone know what 29 tons of fish looks like?!—there is an easy way to get to know our neighboring Atlantic Ocean up close and personal. The Massachusetts Office of Coastal Zone Management (CZM) has created an Ocean Management Education Guide website—**www.mass.gov/czm/oceanmanagement/education/index.htm**—for this purpose. The site contains a compilation of ocean-related activities—from the fun "Mr. and Mrs. Fish Marine Education Program" for elementary schools to the more serious "Cape Cod Bay Marine Life Cruise" to the roll-your-sleeves-up and go "Site Seining in Wellfleet"—there is something for all ages and levels of curiosity. The education guide's overview of linked sites can help you determine what places and activities you would like to learn more about. All relevant details, including hours and season(s) of operation, volunteer opportunities, contact information, and location(s) are listed as well.

So go ahead: beat the heat on an educational summer boat cruise, solve and underwater mystery with Mr. & Mrs. Fish, learn about making a life at sea from a commercial fisherman, experience first hand what life forms inhabit local estuaries, find out if dolphins sleep, or why some lobsters are blue! Educators, parents, and kids are all encouraged to dive in and explore the site for activity ideas. And, if you are involved in ocean education, or know of local ocean-related activities that you would like included on the regularly updated site, please email: czm@state.ma.us. So, take the plunge—from 20 miles from the shoreline to twenty thousand leagues under the sea, there are more than 60 links to help you chart your next course!

[1] www.ocean98.org

CHIMP FIGHTS BIOINVADERS!

photo by Todd Huspeni, University of California, Santa Barbara

Don't hate me because I'm ugly—hate me because I will destroy marine life as you know it. Yep. I'm the Carcinus maenas*—aka green crab—and I've been invading waters all over the Atlantic!*

By Peter Hanlon, Massachusetts Bays Program

When you were a kid, you were the one who liked to turn over rocks in the back yard just to see what lurked underneath. While other kids recoiled at the site of an odd insect or wiggling worm, you said, "Oh yeah, my mission is to identify that." Now imagine these many years later that your curiosity in all things hidden is about to lead you on an honest-to-goodness search for critters called "bioinvaders."

Can your day get any better?

First, don't be distracted by the primate acronym - CHIMP stands for the Coastal Habitat Invasive Monitoring Program, a program developed in 2003 by Salem Sound Coastwatch, a nonprofit organization dedicated to protecting the environment of the Salem Sound watershed. These "coastal habitat invaders" are considered one of the leading environmental and economic threats to Salem Sound. Invasive species, or "bioinvaders," often have a profound, adverse effect on marine ecosystems. Non-native species that are introduced to coastal waters, such as the European green crab (*Carcinus maenas*) and Asian shore crab (*Hemigrapsus sanguineus*) can prey on commercially valuable shellfish, while other invaders get their kicks chewing up piers and pilings, clogging pipes, damaging fisheries, and causing public health problems.

Along the coast of Massachusetts, scientists have witnessed these invasions and their effects. A 2003 assessment of marine invasive species along the Northeast U.S. coastline that included a site visit in Salem Harbor confirmed that invasives are invading our waterways (see "*There Goes the Neighborhood*," *Coastlines*, Winter 2004-2005 for more information). But as valuable as it is to have professional scientists searching for the presence of marine invasive species, a small number of experts could never keep an eye on the entire coastline on a consistent basis.

That's where the CHIMP steps in. Scientists from Salem Sound Coastwatch and its partner organizations and agencies provide an ongoing training program providing CHIMP volunteers with both classroom and field training. These trainings teach volunteers about the different ways that marine invasive species are introduced into local waters, and how to identify those species. Once armed with this information, volunteers take their knowledge into the field, making periodic visits to rocky shorelines, salt marsh creeks, tidepools, docks, or pilings to observe and record any sightings of marine invaders. To help volunteers identify invasive species while out in the field, Salem Sound Coastwatch and the Massachusetts Office of Coastal Zone Management (CZM) have developed a set of identification cards with photos, detailed line drawings, background information, written descriptions, and clues to identification for each species (see sidebar *What The *&^%?!*).

CHIMP volunteers look for new invasive species, and also help track the spread of known invaders throughout the region. The program is one of a small number of organized marine invasive species monitoring efforts along the coast of Massachusetts, and the information it collects is entered into an online marine invasive species database (www.marineID.org). Both the database and the CHIMP are part of a marine invasive species monitoring network being created by CZM and its partners, including Salem Sound Coastwatch and the Massachusetts Bays Program. The baseline information collected through this expanding network is essential for coastal resource experts to develop policies and plans to deal with the spread of known marine invasive species, as well as the introduction of potentially harmful new species.

So for those of you who are excited by getting up close and personal with tide pools, salt marshes, or even the underside of the dock at your local marina, all in the name of helping to protect our coastal waters, Salem Sound Coastwatch has a job for you. Get in touch with them at (978) 741-7900, or learn more at www.salemsound.org.

Eeeiw - that's naaaasty! Didymosphenia *is a type of algae, an invasive type in some regions of North America. It attaches to rocks in streambeds and may impact freshwater fish, aquatic plants, and important aquatic insects.*

Codium fragile *by any other name is Dead Man's Fingers. This dark green finger-like alga takes over intertidal zone. Not good.*

What The *&^%?!

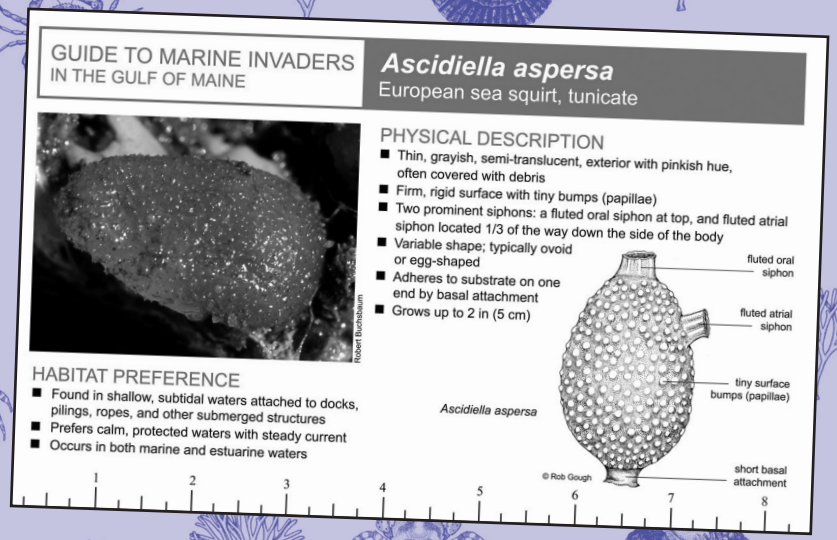
By Peter Hanlon, Massachusetts Bays Program

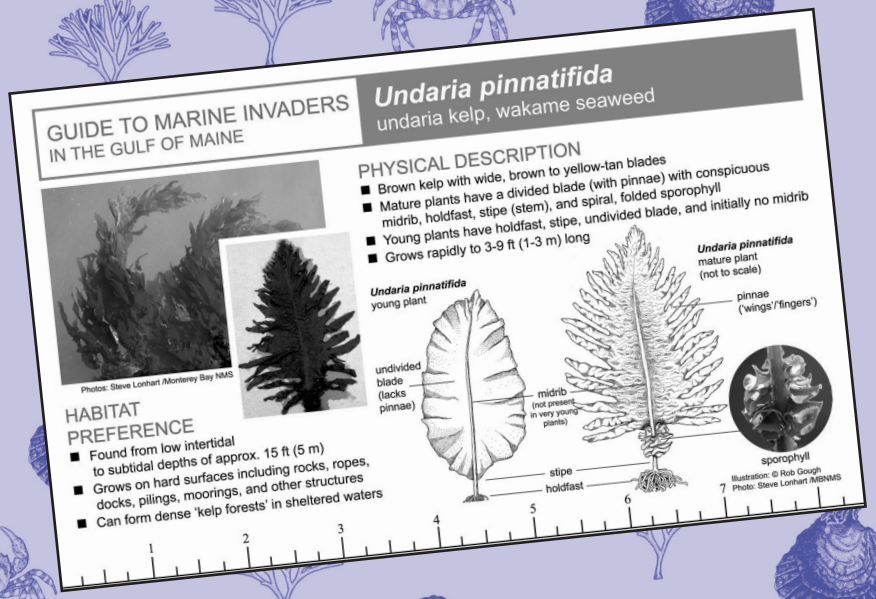
Identifying marine life in the wild can be tricky business, especially if you're just learning how. To help volunteers participating in the CHIMP, Salem Sound Coastwatch and the Massachusetts Office of Coastal Zone Management have developed a set of identification cards that make it easier to correctly identify marine invasive species. The 5.5"x8.5" cards are full color, weather resistant, and easy to read. Each card contains:

- ◆ Images and/or line art of the species.
- ◆ Textual description and clues to identification.
- ◆ Image and/or line art of similar species.
- ◆ Invasion status (introduced, or cryptogenic-i.e., of unknown origin).
- ◆ Preferred habitat.
- ◆ Native range.
- ◆ Current range.

Identification cards for twenty different species are complete and available in PDF form at: http://www.salemsound.org/mis/misid.htm. Or, you can purchase laminated versions of the cards for $20.00 from Salem Sound Coastwatch by contacting info@salemsound.org, or calling (978) 741-7900. All money collected funds the reprinting of the cards and supports monitoring of coastal habitat marine invaders.

Card samples (left) help volunteer monitors identify species that don't belong in the Gulf of Maine. Please note: cards shown here are not shown to scale; actual cards are full-color and show the size of these invasive creatures, along with a measurement guide for easy identification.





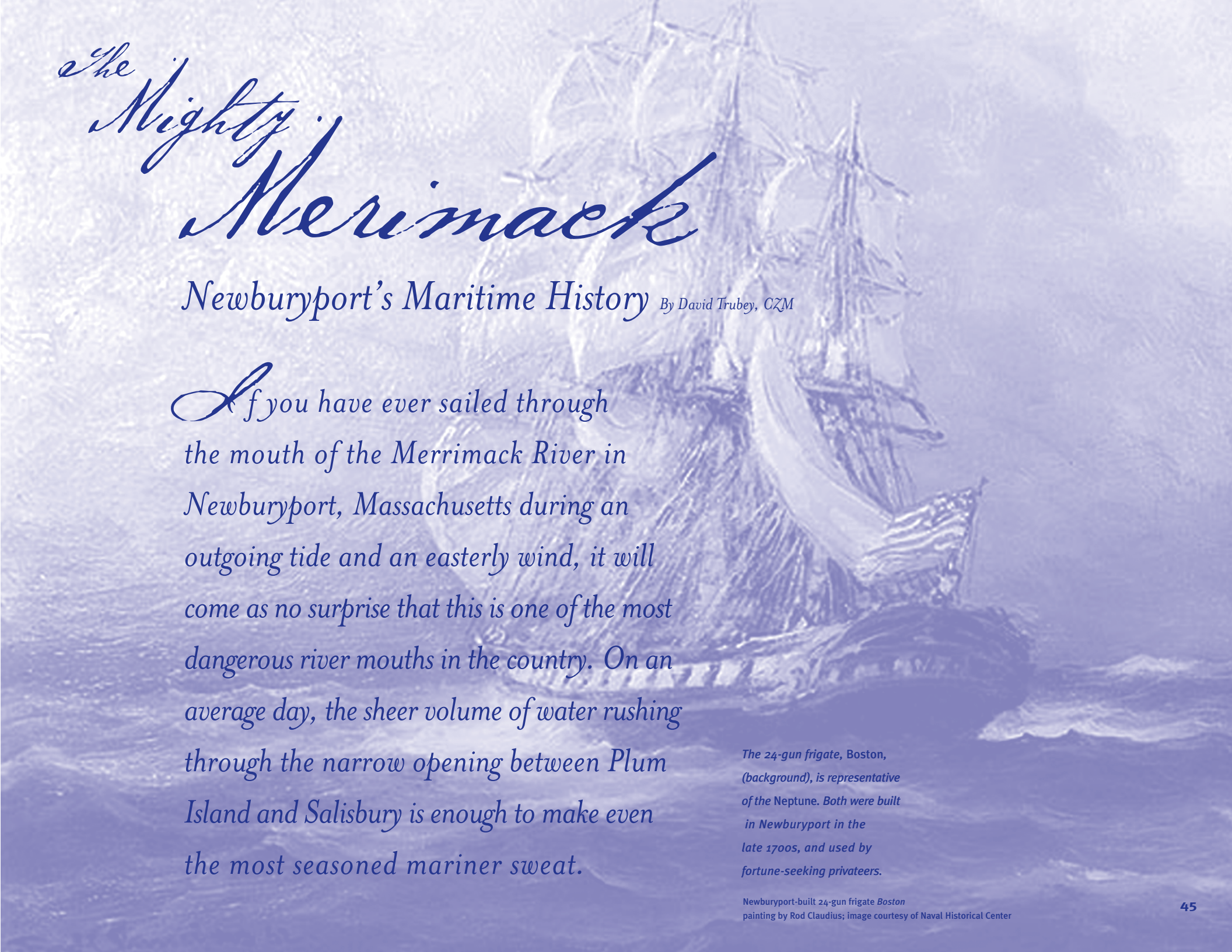
illustrations by Rob Gough

The Mighty Merrimack

Newburyport's Maritime History

By David Trubey, CZM

If you have ever sailed through the mouth of the Merrimack River in Newburyport, Massachusetts during an outgoing tide and an easterly wind, it will come as no surprise that this is one of the most dangerous river mouths in the country. On an average day, the sheer volume of water rushing through the narrow opening between Plum Island and Salisbury is enough to make even the most seasoned mariner sweat.



The 24-gun frigate, Boston, *(background), is representative of the* Neptune. *Both were built in Newburyport in the late 1700s, and used by fortune-seeking privateers.*

Newburyport-built 24-gun frigate *Boston*
painting by Rod Claudius; image courtesy of Naval Historical Center

In a northeast gale, standing waves at the river's mouth make landlubbers on the adjacent jetty check the rocks under their feet to make sure that they are firmly in place. According to files kept by the Massachusetts Board of Underwater Archaeological Resources (MBUAR), at least 70 vessels have come to an early demise in and around this area over the past two and a half centuries. Compared to a significant amount of other Massachusetts river mouths, the Merrimack has more than three times the number of reported wrecks.

While many of these shipwrecks have long since vanished, the details of wreck history are alive and well at the Newburyport Maritime Society (NMS). Since 1970, the NMS has worked "to protect, preserve and interpret the maritime history of the lower Merrimack Valley." This mission is currently accomplished through a variety of educational programs and exhibits at its Custom House Maritime Museum in Newburyport and Lowell's Boat Shop in Amesbury (www.themaritimesociety.org).

Legalized Piracy on the High Seas

Spirited involvement in maritime affairs is nothing new to the Newburyport community. During the early years of the Revolutionary War, the Merrimack River towns of Newburyport and Newbury were largely occupied in the construction and outfitting of privateers. Privateers were privately owned, armed vessels that targeted enemy trade during times of war. In his historical sketch, Ship Building on the Merrimac River, John Currier contends "...the first privateer fitted out within the limits of the original thirteen colonies sailed from Newburyport in August, 1775 . . . ". Privateers, or Letters of Marque as they are sometimes referred to after their official government commission, played a significant role in the period leading up to and during the Revolutionary War when more than 600 hundred Letters of Marque were issued by the Continental Congress (federal legislative body of the 13 American colonies). These letters were, in effect, a license for a private vessel to take reprisal against the merchant vessels of an enemy nation during times of conflict or war. The system, which historian Samuel Eliot Morison describes as "legalized piracy," was extremely beneficial to the fledgling American Navy. American privateers were very successful "...in preying on the enemy's commerce, intercepting his communications with America, carrying terror and destruction into the very chops of the Channel, and supplying the patriot army with munitions, stores and clothing at Johnny Bull's expense."* As noted by Samuel Eliot Morison in The Martitime History of Massachusetts: 1783 - 1860: "Her [privateering] success . . . was probably the greatest contribution of seaboard Massachusetts to the common cause." In addition to the military benefits of privateering, the system

Compared to...other Massachusetts river mouths, the Merrimack has more than three times the number of reported wrecks.

** In literature and political cartoons during this period, the term "John Bull" was commonly used to personify England and English manner.*

also contributed socially to Massachusetts's coastal communities by employing fishermen and other maritime related tradesmen such as shipbuilders and sailors.

Privateering on the Merrimack: Neptune's First and Final Voyage

While privateering brought wealth to some citizens of the newly founded community, the loss of life in Newburyport was substantial relative to its population. According to Currier, 22 vessels with crews totaling more than 1,000 sailors were lost from that port. One such vessel was the privateer, Neptune, constructed at the Cross Yard in Newburyport and commanded by Captain William Friend. Neptune appears to have been a relatively small vessel of 16 or 20 guns. While heading to sea, she was lost shortly after exiting the mouth of the Merrimack River. *The Independent Chronicle* and *The Universal Advertiser* of August 29, 1777, reports that "Thursday last a 20 gun ship, coming out from Newbury-Port, instantaneously overset, and in a little time after went down head fore mast in 14 fathom water; providentially a sloop and boat being near, took off all the hands but one just as she went down. The whole crew consisted of about 70." While the exact location of this wrecking incident is not known, one historical source states that Neptune was "...about a league [3.18 nautical miles] from the bar."

In the coming months, the MBUAR, with the assistance of the NMS, will be delving into the mysterious disappearance of Neptune. It is hoped that historical research combined with marine remote sensing of the Merrimack River coastal area might shed some light on the vessel and its significance to the maritime heritage of Newburyport and the Commonwealth.

[1] Morison, Samuel Eliot, 1961 *The Maritime History of Massachusetts: 1783-1860*. Northeastern University Press, Boston.

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Not all of the Merrimack River is as placid as this. Parts of it can get crazy rough.

Shipwreck Preservation Appreciation *By David Trubey, CZM*

In 2003, as part of an ongoing effort to work with local communities, the Massachusetts Board of Underwater Archaeological Resources (MBUAR) teamed up with the Newburyport Maritime Society (NMS) to create programs that would foster an awareness of and appreciation for the area's shipwrecks. In 2003-2005, in recognition of Massachusetts Archaeology Month, an annual program promoting archaeological research across the state, the MBUAR, NMS, and Public Archaeology Laboratory, Inc. of Pawtucket, Rhode Island, sponsored events highlighting the role of technology in the detection and exploration of shipwrecks and other submerged archaeological sites. These events featured guest speakers, equipment, exhibits and images of local shipwrecks, and—perhaps even more importantly—helped generate excitement about historic shipwreck preservation.

In October 2005, the MBUAR and NMS unveiled a new program dedicated to the reporting and documenting of shipwrecks along the banks of the Merrimack River, the beaches of Plum Island, and the Salisbury shoreline. Known as the Shoreline Heritage Identification Partnerships (SHIPS), this program trains volunteers to recognize the structural elements of shipwrecks, which often make but a brief appearance before disappearing in the shifting sands. Additionally, volunteers are trained to accurately record locations, take basic site measurements, and notify archaeologists at the MBUAR when wrecks are spotted. The SHIPS program is expected to play a significant role in the research and protection of local shipwrecks and in fostering local stewardship of our maritime heritage. If you are interested in getting involved, please call (617) 626-1032.

Children explore a simulated wreck at the Custom House Maritime Museum during Massachusetts Archaeology Month, Nearly 1,500 pounds of sand were brought in to make the activity realistic.

Plymouth:

It's Not Just For Pilgrims Anymore

By Arden Miller, CZM

When it comes to history curriculum in the United States, there are several "lessons" few children leave behind. Up there with "In fourteen hundred and ninety-two, Columbus sailed the ocean blue," the story of the Boston Tea Party, and Paul Revere's midnight ride, is the story of the Pilgrims. From sea to shining sea, unless you've been living under a rock, chances are you've heard of the Pilgrim's sailing across the Atlantic on the *Mayflower* and landing on Plymouth Rock. (Whether or not they *literally* landed *on the rock* is a subject of some debate, but more on that later.)

Between a Rock and a Harsh Place

So, to begin at the very beginning, the group that has come to be known as "the Pilgrims" were originally residents of England. (See sidebar "*Once a Separatist Always a Pilgrim?*" for details on their departure.) There were 101 passengers, plus crew, when the *Mayflower*—a cargo vessel allegedly used to transport wine from France to England—set sail (a baby boy, aptly named Oceanus, was born *en route*, bringing the passenger total up to 102 by landing time). Seas were rough and daily meals consisted of dried fish, salted meat, and "oatmeayle." On November 21, 1620 by modern-day calendar calculations, after 66 days days at sea, the *Mayflower* landed in what is now Provincetown, Massachusetts. After a few exploratory trips around the peninsula, they decided there was too much sand, not enough fertile soil, and that they could probably do better. A smaller expedition led by the famed Miles Standish (the only man on the *Mayflower* not named William, Jonathan, Peter, Edward, or Isaac, incidentally), journeyed farther out and found the area we know

today as Plymouth. Fellow passenger, group historian, and future Massachusetts Governor William Bradford, described the area "fitt for situation" with "...diverse cornfields and little running brooks..."

As for its "fitt-ness," those who lost loved ones during the first harsh winter (more than half of the original passengers perished) may have wished that they'd continued on to Virginia, but none of their diaries have been unearthed. We could speculate that those who survived were, indeed, the forefather's of grit and hardiness that is associated with the "Yankee spirit." Undeterred by reports of this first unfortunate winter, three ships full of their fellow Separatists from Leiden, Holland followed; the Fortune landed in 1621, and the Anne and Little James both arrived in 1623. In a letter from *Mayflower* passenger Edward Winslow to his fellow Separatists, he recommended that they bring the following to their home-to-be: "Be careful to have a very good bread-room to put your biscuits in. Let your cask for beer and water be iron-bound...bring good store of clothes and bedding with you. Bring every man a musket or fowling piece...paper and linseed oil for you windows, with cotton yarn for your lamps." By all accounts, early life was often difficult; dwellings were simple structures made of wood with the aforementioned paper-and-linseed oil windows and food had to be hunted, harvested, or bartered for. (In the early days, those who farmed the land were called "Planters" while those who ventured out of the colony to make a living trading goods overseas were known as "Adventurers.")

Subsequent settlers' survival rates were higher than the *Mayflower* passengers'. The town, which was called New Plimouth until the 1700s when it became Plymouth, was built around the First Parish Church (which still stands today at 19 Town Square). As with much of New England, trade routes and the promise of a more prosperous life led more people to the area. Many immigrants from Portugal, Italy, Germany, and other parts of Europe made Plymouth their home. From 1825 to 1969, the Cordage Rope Company employed much of the town. (Cordage was a major manufacturer of rope during this time; today the original factory has been reconverted to house shops and restaurants). Being in an area with forests, ponds, streams, and the Atlantic, hunting and fishing opportunities were plentiful and sustained many (to this day, there is an official hunting season in Plymouth's Miles Standish State Park.)

photo by Don Teague

Bogged Down: Plymouth has cranberry bogs galore. Tours of Ocean Spray's Cranberry World explain their various uses. And, speaking of uses, the Plymouth Bay Winery even has cranberry wine—free for the tasting during a tour of their winery.

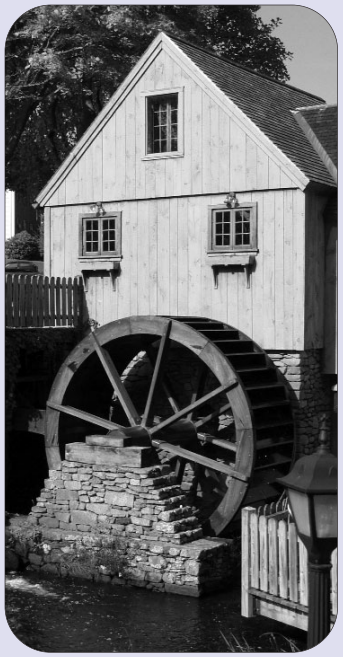
Through hard work and the luck of geography, many "Adventurers" made their fortunes at sea and a number of houses that reflect these fortunes can be seen on Sandwich, Water, Court, and Leyden Streets.

Rock Solid History

And the rock? Well, according to Bill Bryson, author of the New York Times Best Seller *A Short History of Nearly Everything*, "The one thing the Pilgrims certainly didn't do was step ashore on Plymouth Rock. Quite apart from the consideration that it may have stood well above the high-water mark in 1620, no prudent mariner would try to bring a ship alongside a boulder…" But other sources say otherwise. The Elder Faunce (alleged to be 95 years of age in 1741) claimed that his father, a passenger on the *Mayflower*, showed him this site as a boy and told him that was where they landed. This unassuming (it's only three feet across), yet larger-than-life rock has had a number of well-documented adventures over the years. In 1774, the townspeople attempted to move it and, in the process, split it into two separate halves! They left the bottom portion at the wharf and carried the top half to the town's meeting-house. From there, it took a trip to Pilgrim Hall in 1834. When the Pilgrim Society completed a Victorian canopy over the lower portion of the rock in 1867, the top was reunited with the bottom and "1620" was carved into the rock, setting the now-famous date in stone. Then, 300 years after the Pilgrims set their sites, and possibly their feet, on this granite ballast, the Plymouth waterfront was rebuilt with a promenade structured so that the rock appears at water level.

In spite of—or, more likely because of—its past, the rock lives on, inspiring many a tourists to make a pilgrimage to Plymouth. And after checking out the famed rock, there are a number of other things to do. While at the waterfront, visitors can explore a replica of the original *Mayflower* called, succinctly, *Mayflower II*. (The original *Mayflower* returned to its trade routes post-Plymouth, until it was declared "in ruinis" and sold for scrap in 1624.) Those thirsting for cranberry wine, or just curious about how fruit wines are made, can enjoy free tastes and tours at the Plymouth Bay Winery. And, speaking of cranberries, Ocean Spray's "Cranberry World," also in Plymouth, gives free tours. Going back further in time, the original Grist Mill that provided flour to the Pilgrims and their descendants is also open for tours. And, if you're into history, you can check out the site of the Pilgrims' first meeting house and fort at Burial Hill (right next to the First Parish Church) and the Wax Museum with wax replicas of historical figures. And, of course, there's the Plimouth Plantation, one

On Cranberry Road you can bike, hike, swim, and camp at Miles Standish State Forest.



photos by Don Teague

In the Days of Yore, the Grist Mill was a vital part of the community, for man cannot live on oatmeayle alone.

of the country's oldest "living history" museums where the staff dress, talk, and interact in keeping with the researched inhabitants of Plymouth in 1627. (Don't get confused if you're there on a Sunday and they tell you it's Monday; in 1627s, Sunday was a day for worship and reflection, a literal day of rest, and no Pilgrim worth their fowling piece would even consider working.) And there's the state park named after the original adventurer, Miles Standish, which is open to the public year round. Plymouth Town Manager Mark Sylvia explains what he thinks makes Plymouth special: "We're enormously rich with resources—historic, natural, economic, and community-wise. Plymouth has beaches, numerous inland water resources, naturally occurring Pine Hills, and we're also home to a lot of species, including the endangered Plymouth Redbelly Turtle [*Pseudemys rubriventris bangsi*]. And because so many generations have remained here, a sense of history is passed down and imbued in the town. You can feel it when you walk around."

Top: Mrs. Patience Watson and many of New England's earliest settlers rest in Plymouth.

The Plimouth Plantation (right) is a place to experience how life was lived when Plymouth was spelled Plimouth.

photos by Don Teague

Measuring in at 104 square miles, Plymouth has the largest land area of any town in the Commonwealth. Being 37 miles from Boston, and 5 miles from the Cape Cod Canal, and having the Atlantic Ocean as its eastern border, it's a desirable location for many. In 1970, the population was just over 18,500—by 1990 that figure increased to more than 45,000 people. In 2005, the Plymouth Police Department estimated the town contained 54,000. Despite considerable population growth, the New Plimouth of yore is still very much present today. Leyden Street, which runs the course of the downtown and is named after—you guessed it—the Pilgrim's previous home in the Netherlands, is a permanent reminder of the town's roots. "Just to imagine this is where the Pilgrim's village actually was is pretty amazing," says Don Teague, Membership Director of Destination Plymouth. And, as a destination, Plymouth has the distinction as being known as "America's Hometown." "We weren't the first town in America—that distinction, *sigh*, goes to Jamestown, Virginia—but we were the first town designed around living as a community rather than as a place to profit from," Teague says. "It's a place unlike any other - well worth the trip, and much easier to get to than it was in 1620!"

For things to do in Plymouth, check out:

www.mass.gov/dcr/parks/southeast/mssf.htm

www.visit-plymouth.com

www.plimoth.org

Once a Separatist, Always a Pilgrim?

By Arden Miller, CZM

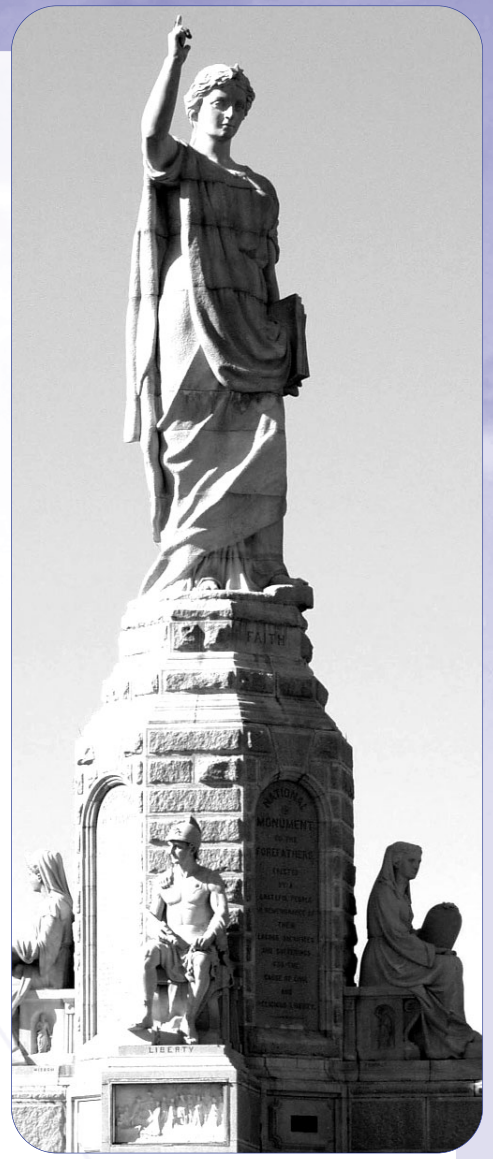
Only in the United States is the word Pilgrim spelled with a capital 'p' to refer to the group of men and women who landed on the shores of Massachusetts in November of 1620. Traditionally, the word "pilgrim" is used in the lower case to refer to one who is going on a religious quest, usually when a trek of some distance is involved, to a place of established religious significance (e.g., Muslims visiting Mecca, Christians and Jews visiting Jerusalem). That this group of early settlers was, in fact, on a religious quest—or, rather, on a quest for religious freedom—possibly explains the association. For many years, centuries even, the passengers of the first four ships to settle in Massachusetts were referred to as the "First Comers" or "Forefathers." It wasn't until the 1800s when the journals of Mayflower passenger and Governor of Plimouth William Bradford's journals were returned from England to Massachusetts and his quote. "So they left the good and pleasant city, which had been their resting place near 12 years. But they knew they were pilgrims and looked not much on those things, but lifted up their eyes to the Heavens, their dearest country, and quieted their spirits" became widely known that the moniker stuck.

Separate and Not-so-Equal

But, before they were Pilgrims, and before they left England for New England, they were known as Separatists. What was a Separatist, you wonder? Well, in the days of mutton chops and moats, Henry the VIII was the King of England. England, like much of the world in the early 1500s, was under the rule of the Pope and the Catholic Church in Rome, and church and state were one and the same. When Henry the VIII wished to divorce his wife—strictly forbidden in the Catholic church—he decided to start his own church. Between bouts of gout and beheadings, Henry severed all ties with Rome and, in 1537, the Church of England was born. Not everyone was on board though. And a small, but active and organized contingency in the Midlands area of Scrooby, Nottinghamshire were determined to have their own separate congregation. People who subscribed to this separate church became known as Separatists, the persecuted of their day. And where does anyone who wishes to escape persecution and to worship in their own way go? Amsterdam!

Scrooby Dooby Who??

The Scrooby Separatists, many of whom were imprisoned under Queen Mary's regime, feared for their futures and a group of approximately 30 people left England (in secret, natch) in 1608 to live and let live in the land of tolerance. After a mere year in Amsterdam, they headed to the university town of Lyden in the Netherlands where they spent more than a decade, many making their living working in textile mills and the university. Rumbles of war between Spain and the Netherlands, plus a fear that their children were losing their English identity, led the group to seek their fates in the unchartered territories of New England. The group had permission to settle in the northern part of Virginia, but the Mayflower charted another course and the Separatists became Massachusetts' First Comers on November 11 (by the Roman calendar which, unlike their religion, was still widely recognized), 1620. And the rest, as they say, is history.



Gotta have faith! Faith stands on top of Plymouth's National Monument of the Forefathers.

photos by Don Teague

Ask Joe *By Arden Miller, CZM*

Joe, a Massachusetts resident since 1974, began working at the Massachusetts Office of Coastal Zone Management (CZM) in 1980. He has represented CZM on numerous committees involved with coastal and marine issues.

What types of coastal issues are distinct by region and which kinds affect all of the regions? All regions are affected to some extent by stormwater run-off, public access issues, and development pressure. They just vary in intensity and details. The area north of Cape Cod is part of the Gulf of Maine and, geographically, typically has a rocky coast, whereas the area south of Boston is known for its sandy beaches and dunes. So beach erosion is an issue specific to the sandy areas. In terms of coastal development, the area from Boston Harbor north tends to have more people and more industrial uses (including the working ports of Salem and Gloucester). Both areas have a limited amount of coastal space, and a lot of people want access to it. And since the coast is finite and everyone and their brother wants a view of it, there is always pressure to build in the few undeveloped areas.

During the time you've been a part of the Massachusetts Emergency Management Team, what coastal area disasters generated the most media attention? Between August, 1991, and November, 1992, we had three presidential declarations of disaster. In August, it was Hurricane Bob. In October, Bob was followed by the "No Name Storm" or "Halloween N'oreaster" as it was referred to. (Since then, with the publication of Sebastian Junger's book *The Perfect Storm*, this storm has come to be known by the book's title.) And then, between December of '92 and March of '93, there were two intense winter blizzards that were bad enough to warrant a declaration. These were very busy times for Massachusetts and hazards. As part of the disaster team, I was on camera so much, the Assistant Director joked that CZM should sell ad space on my jacket sleeves!

During the past 30 years, which coastal region have you seen the most changes in when it comes to physical and economic development? Definitely Martha's Vineyard and Nantucket have changed the most significantly when it comes to physical development. Just in terms of sheer numbers of people and all the amenities that go with them—more buildings, more stores, and more parking lots equal more issues when it comes to water quality, parking, traffic, and beach access. As for economics, the fishing industry has changed dramatically. Going back 30 years, Massachusetts was in the top 10 in terms of value and volume and Gloucester, New Bedford, Boston, and Chatham were all within the top 25 ports in the nation. Now, due to overfishing, regulations, and environmental conditions, that's all dropped significantly, though, I must say, the fish tastes just as good! And, while the average fish catch has fallen, the cost of living in Massachusetts has risen. For a fisherman, just catching the amount of fish to earn a salary you can live on is a very difficult proposition these days.

In your opinion, which coastal town in Massachusetts most embodies the qualities associated with New England? Boston and Salem represent what I think of as quintessential New England. Both have the rich maritime history coupled with the feeling of small towns. Even Boston, with nearly 600,000 residents, has a small town atmosphere. I see the same people on the train every day. And, in the summer, you can smell the coastal air in Boston. And just look at the State House—there's a life-sized sacred cod plaque hanging in the Chamber of the House of Representatives! In Salem, if you take a walk down Federal Street, you'll see all the brick facade Federalist houses that were built during the heyday of the clipper ships when captains made their fortunes at sea.

What local-level issue has caused the most impassioned reactions from people? The development and implementation of the Massachusetts Water Resource Authority's underground tunnel and accompanying sewage treatment plan. In 1983, when this plan was unveiled, Boston Harbor was filthy. Fish kills were reported on a daily basis. The sewage was only treated in a primary way—which is to say that large items were screened out, and the rest was dumped directly into the Harbor. The new proposal was for sewage to receive secondary treatment, meaning that after the primary treatment, sewage is further filtered to remove all sludge. The effluent would then travel through a deep rock tunnel extending under Massachusetts Bay to about nine miles east of Deer Island. No one was sure if this would change things; people wondered if it was going to be like playing three card monte—changing the location and varying the treatment, but without any real difference. And beyond all the wondering was the outrage over the expense. The proposed tunnel was the first of its kind and people doubted it could be pulled off. We're still paying for it in that our water bill used to be, like, nothing, and now, well... But the gamble did pay off: the Harbor is a lot cleaner and I can't remember the last time a fish kill was reported.

What coastal town has the best fried clams? Oooh—that's a tie. Clam Box in Ipswich or Essex Sea Food in Essex, on Cape Ann. Different batters, but both are delicious!

Quintessential New England coastal view: sunset over Ipswich Bay.

photo by Patricia M. Pelczarski